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Effect of light and discharge on periphyton colonization in headwater streams.

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Periphyton colonization is directly affected by physico-chemical and biological factors in headwater streams. However, the relative importance of these factors on periphyton dynamics is rarely determined. We specifically examined the effect of light and discharge on the rate of colonization and succession of periphyton by comparing the community structure and biomass of natural rocks and that of artificial substrata (unglazed tile 3.7 x 9.5 x 2cm) from spring to summer. Weekly changes of algal biomass (chl. a) from 2 sites (open reach: 20-30% of full sunlight, shaded: 1-2%) were monitored in a well preserved 2nd order softwater stream for 10 weeks (pH: 6.5-7.0, alkalinity: 6-16 mg CaCO₃/l). The biomass on artificial substrata exposed in the shaded site (14.7 mg/m², n=8) exceeded that of natural substrata (8-12 mg/m², m=7) in 5 weeks and was maintained for several weeks. However, periphyton development in the shaded site was much slower and never exceeded that of natural substrata during the study period (artificial substrata: 0.6-2.5 mg/m², natural: 3-5 mg/m²). Diatom initially colonized at both sites and dominated the periphyton communities (over 80-90%). Even though heavy rainfall over 80mm of precipitation within 2 days caused strong substrata movement, it did not affect the biomass associated with different size classes of substrata. An identical experiment conducted two first order streams with a different nutrient and light regime also indicated that light might be one of the most important factors on periphyton dynamics in the forested headwater stream ecosystem.

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Phytoplankton dynamics in the lower part of the Nakdong River in S. Korea.

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Though history of phytoplankton study on the Nakdong River has been passed for a long time (about 30 years), most studies focused on species composition rather than factors regulating population dynamics. From spring 1993 to summer 1994, we conducted biweekly sampling at the Mulgum site which is located in the lower part of the Nakdong River and examined the changes in cell number, biomass (chl. a), biovolume and physico-chemical factors. There was a strong periodicity of phytoplankton during the study period: diatom-green-blue green-diatom. Diatoms were major constituents (60%) in early spring (Mar. - early Apr.) and late fall. From late spring to summer, green algae became a major group. Blue greens appeared during summer and early fall. Algal biomass and biovolume followed similar patterns of cell numbers. Two Chl. a peaks caused by diatom bloom were observed (From late Mar. to early Apr. of both years, late fall of 1993, 120-140, 110 µg/l, respectively). Annual mean algal biomass was extremely high (40±37.1 µg/l, n=25), indicating the hypereutrophic nature of this water body. However, during the flooding period (Jun. - Aug., half of total annual precipitation), levels of algal biomass were low due to dilution (3-25 µg/l). Nutrient levels were relatively high (NO₃-N: 2.0 mg/l, PO₄-P: 0.03 mg/l, n=25). However, silica depletion (below 0.5 mg/l) was found in spring and fall when diatoms actively reproduce. Through this study, we conclude that patterns of phytoplankton succession in the Nakdong River is the "mixed type" between the typical river type (eg., diatom dominance, influences of hydrology) and the lake type (eg., silica depletion, appearance of blue greens). The effect of zooplankton grazing, hydrologic influences on community stability, longitudinal distribution and the role of limiting nutrients deserve further intensive study.